DOCUMENT RESUME

ED 399 757 EC 305 096

TITLE Guidance from the Graphical User Interface (GUI) Experience: What GUI Teaches about Technology Access.
INSTITUTION National Council on Disability, Washington, DC.
PUB DATE 28 Mar 96
NOTE 38p.
AVAILABLE FROM National Council on Disability, 1331 F St., NW, Suite 1050, Washington, DC 20004-1107; telephone: 202-272-2004; tty: 202-272-2074; fax: 202-272-2022.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Accessibility (for Disabled); Access to Information; *Advocacy; *Blindness; Civil Rights Legislation; Compliance (Legal); Computer Graphics; *Computer Interfaces; Employment; Employment Opportunities; *Technological Advancement; *Visual Impairments
IDENTIFIERS *Graphical User Interfaces; Microsoft Windows; *National Council on Disability

ABSTRACT

This report investigates the use of the graphical user interface (GUI) in computer programs, the problems it creates for individuals with visual impairments or blindness, and advocacy efforts concerning this issue, which have been targeted primarily at Microsoft, producer of Windows. The report highlights the concerns of individuals with visual impairments that they may lose employment opportunities because of GUI. The report discusses the advocacy of the National Council on Disability (NCD) and the actions that were taken to convince Microsoft to develop a screen reader applications programmer interface, so that screen readers could interpret information being sent to the screen. The report reviews the effectiveness of disability legislation and efforts to use civil rights provisions to prevent sales of Windows 95 by government agencies. The resulting shift in Microsoft's stance on GUI accessibility is noted, including Microsoft's decision to enable independent software vendors to develop third party accessibility aids to allow individuals with blindness to use Windows 95 by way of a screen reader. The role of the NCD in this issue is reviewed, and recommendations are offered for helping individuals with disabilities to benefit from advances in technology as much as others do. (CR)

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GUIDANCE FROM THE GRAPHICAL USER INTERFACE (GUI) EXPERIENCE:

WHAT GUI TEACHES ABOUT TECHNOLOGY ACCESS

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EC 305096

National Council on Disability

March 28, 1996

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Publication date: March 28, 1996

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ACKNOWLEDGMENT

The National Council on Disability wishes to express its sincere appreciation to Bonnie O'Day and Jamal Mazrui for their leadership in technology accessibility, and to Fred Pelka for his hard work and valuable suggestions in preparing this report.

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PREFACE

In August 1994, members and staff of the National Council on Disability (NCD) began meeting with representatives of the disability community and officials of Microsoft Corporation to discuss access to Windows-based software for people with disabilities, especially people with severe visual impairments.

As part of its research agenda, NCD established Tech Watch, a community-based, cross-disability consumer task force on technology. The 11-member task force provides information to NCD on issues relating to emerging legislation on technology and helps monitor compliance with civil rights legislation, such as Section 508 of the Rehabilitation Act of 1973, as amended.

This report was commissioned by NCD on the advice of Tech Watch. It is a retrospective analysis of the crisis for people with visual disabilities that was caused by the widespread adoption of the graphical user interface in information technologies. Numerous interviews were conducted to trace the history of the crisis and the response from the disability community in general and NCD in particular. The report makes recommendations to NCD on how such a crisis might be averted in the future, so that people with disabilities will benefit as much as others, from advances in technology.

INTRODUCTION

> *The blind community is at the highest risk right now of being first liberated by computers in the eighties, and now enslaved in the nineties.*
> (Charles Crawford, *Boston Globe*, October 17, 1994.)

In early January 1994, Henry Archin went for a job interview at Wellfleet Communications in Billerica, Massachusetts. Archin, totally blind since birth, was hoping for a position in the company's telephone customer service department. The interview went well, and Archin asked the Massachusetts Commission for the Blind to evaluate what special equipment or software he might need to work in Wellfleet's computer environment. That's when he heard the bad news.

Wellfleet uses Microsoft Windows, a computer program with a graphical user interface (GUI). Office software that uses an entirely text-based interface can be made relatively accessible to a blind user through a screen reader program that converts what is on the screen into braille or synthetic speech; however, there is no equivalent program for Windows reliable enough to enable Archin to do the job. A Wellfleet representative expressed his regret, but Archin did not get the position.

Charles Crawford, commissioner at the Massachusetts Commission for the Blind, uses the folk tale of John Henry to illustrate the situation of blind computer users in America today. John Henry, it will be remembered, was "a steel drivin' man" who raced a mechanical rail-driver in an attempt to save his job. John Henry won the race, but lost his life. Steel driving men passed into history, tossed out of their jobs by changing technology.

The crisis that graphical user interfacing poses to blind computer users has been building for a long time. Ever since the introduction of GUI (pronounced "gooey") into the software market in the mid-1980s, software accessibility experts had warned of the potential for lost jobs and careers as people who were blind or visually impaired were

confronted by a new technology that was impossible for them to use. By 1994, with the imminent unveiling of Microsoft's Windows 95, this nightmare seemed on the verge of becoming reality, as more and more offices contemplated the switch from the older, disk operating systems (DOS) to Windows. "The reality," wrote Crawford that year, "is as cold as the unemployment lines that may soon become the home of thousands of people who are blind."

This report was commissioned by the National Council on Disability's (NCD) Technology Watch task force. Tech Watch was established by NCD in January 1995 and consists of Council members, software accessibility experts, and technology accessibility advocates and consumers. The purpose of the report is to trace the development of and community response to the GUI crisis. How did this crisis happen? Could it have been prevented or attended to earlier, before it began to compromise the livelihoods of people with disabilities? What was the role of NCD in resolving the crisis? What can NCD do to prevent similar crises?

The report also examines the effectiveness of current legislation in dealing with this issue. In particular, advocates turned to the Americans with Disabilities Act (ADA), Section 508 of the Rehabilitation Act, and the Technology Related Assistance for Individuals with Disabilities Act in their efforts to convince the software industry to incorporate access into their products. How well did the language of these laws meet the needs of the day? How well are the laws being enforced? And what can NCD do to ensure that these laws and their enforcement better serve the needs of Americans with disabilities?

THE GUI CRISIS

What Is GUI?

A computer user interface is the place where machine and human being communicate with each other. It is how we tell computers what we want and how they present to us the information we request. Today, the most common user interfaces involve a keyboard, viewscreen, and, more and more often, a mouse.

A graphical user interface is a computer-user interface that uses graphical screen images as well as typed text, with icons on the screen replacing many of the functions of the keyboard. For example, in a typed text interface, the command to move data from one file to another is typed into the computer as a line of code meaning, "Send this letter from file A to file B." In GUI, a user might send this command by placing the cursor on the letter (represented by the image of an envelope), and moving it with a mouse across the screen from file A (represented as a rectangle), to file B (represented as another rectangle). Click the mouse, and the transfer is complete. Many sighted people find GUI easier to use, because they don't have to remember or to look up special commands for each program function. Less time is spent figuring out how to get the computer to do what you want it to do.

GUI can be used by people who are blind and visually impaired, provided they have a reliable screen reader to translate what's on the screen into braille or synthesized speech. The development of screen readers for the older, DOS-based systems is quite advanced, and a number of private companies presently compete for the screen reader market.

What Is the Crisis?

GUI offers a special challenge to designers of screen reader programs. In text-based interfaces, almost everything on the screen is a letter, a number, or punctuation,

and is easily discernable by the screen reading program. Furthermore, in these earlier systems, the information flow to and from the screen is relatively accessible to the screen reader. In graphical user interfaces, however, the screen can contain many symbols or icons, which are much more of a problem for screen readers to decipher. In addition, the information that is sent to and from the screen is more difficult for screen readers to interpret. And of course, GUI is at heart a presentation system designed with sighted people in mind. Successive menus, pull-down windows, icons, screen buttons, bombs, palettes—all were introduced to provide greater ease for sighted users.

Gregg Vanderheiden, director of the Trace Research and Development Center at the University of Wisconsin-Madison, recalls, "With DOS, you could write a screen reader easy as rolling off a log. Well, in Windows, it turned out to be not so easy to write those programs. So this was a real problem."

The impact of this problem threatened to escalate dramatically in 1994, with the impending arrival of Windows 95, the Microsoft Corporation's newest GUI operating system. Windows 95 promised to be much more competitive than previous Windows products, and its unveiling was to be a major business event. What would happen when the business and professional worlds were dominated by software that used GUI exclusively?

Judy Brewer, project director for the Massachusetts Assistive Technology Partnership (MATP), remembers, "Particularly from the middle of 1994 up through the fall, there started to be an increasing stream of phone calls from around the state, from blind computer users who were saying things like, 'I'm terrified I'm going to lose my job; my department is switching to Windows—how can I adapt to this?' And we'd have to say, 'Well, we're not sure.' Or they were saying, 'I'm really frustrated—I just lost a promotion, because to move up in my job I'd have to be able to move to Windows.' Or somebody would say, 'I just lost my job, because we've been unable to find an accommodation.' It wasn't huge numbers, but given the low incidence of blindness relative to other disabilities, it was very alarming. Here were people who were very

skilled computer users, and they were getting bounced out of what had been a phenomenally good technology to use: the combination of DOS and screen readers."

As the release date for Windows 95 drew near, advocates feared that blind computer users were about to face vocational extinction.

Why Microsoft?

It is a reflection of the company's success that the Microsoft Corporation came to be at the center of the GUI crisis and the focus of subsequent advocacy efforts. Microsoft products dominate the world of GUI. The advent of Windows 95 promised an enormous acceleration in the shift away from DOS and toward GUI.

It is important to note here that disability advocates, and NCD, have expressed concerns about GUI accessibility to companies other than Microsoft. It should also be stressed that the management of Microsoft was by no means opposed to greater accessibility to computer products by people with disabilities. Microsoft had, for example, worked with accessibility software specialists to develop a variety of access aids for people with limited dexterity. According to Greg Lowney, senior program manager for the Accessibility and Disabilities Group at Microsoft, Windows 95 was due to arrive on the market with numerous accessibility features already written into the basic operating system, even before the issue of GUI accessibility was raised.

Nevertheless, in terms of access for people with visual disabilities, Microsoft was seen to be lagging. When people with disabilities called their advocates with stories of how the move to a new operating system was suddenly limiting their opportunities, the systems they invariably mentioned were developed by Microsoft. The irony, as Brewer points out, is that "the highly accessible standard which screen reader users had been accustomed to was in fact an earlier Microsoft product, MS DOS. In other words, the essential problem was not the company, but the technology, and then...the company's failure to respond to concerns about its technology." Thus, despite the company's success with other forms of computer accessibility, its estrangement from blind computer users was near total.

As Charles Crawford put it, "We were using Microsoft as the primary target because they were the biggest developer of this kind of software, and everything was going in the Windows direction."

Early Awareness of the Problem

Although the GUI crisis seemed to develop almost out of nowhere, there had in fact been numerous warnings. Vanderheiden was among the first to raise concerns about GUI, as early as 1985. Attempting to alert the blindness community, he took his concerns to computer users in the major national blindness organizations. For his efforts, Vanderheiden says he was "yelled at and vilified." Blind computer users, he said, told him that he could better spend his time developing better speech readers for DOS-based systems or advocating for legislation prohibiting the proliferation of GUI.

"I did a conference in Madison (Wisconsin) several years ago, and the question at the time was, Why would a person who is blind want to use graphical user interface? The answer is that they wouldn't, unless they had to. Back then nobody had to because nobody was using Windows. But slowly, over time, Windows came in."

Another early warning voice was that of Susan Brummel, director of the Center for Information Technology Accommodation (CITA), at that time known as the Clearinghouse on Computer Accommodations at the U.S. General Services Administration (GSA). As early as 1988, Brummel and her office attempted to raise GUI accessibility as an issue in federal purchases of software, after the passage of the 1986 Rehabilitation Act Amendments charged GSA with overseeing the implementation of Section 508 of the Act, which required that federal agencies provide workers with and without disabilities equivalent access to electronic office equipment.

"We push as hard as we can," says Brummel, "We wrote an RFP [request for proposals] in the early 1990s that was intended to be a model of [software] accessibility. We included language to ensure that people with disabilities would be accommodated." Brummel stresses that CITA, however, is "not the office that keeps track of what agencies do and don't do. We're like the people in the information window where

somebody comes for an application. We don't know who hasn't come to our window who should have, and we don't know if they really fill out the application or not once they take it away."

Charles Crawford sent several letters on GUI accessibility to the White House and the U.S. Department of Justice. In September 1990, he wrote to President Bush "to share my serious and growing concern....Simply put, developers of hardware and software are not ensuring accessibility to their products...." Crawford believed that Microsoft and other GUI developers could facilitate accessibility by including "hooks"—programming aids for screen readers imbedded in the operating system itself. Failure to do so, he wrote, was a violation of the recently passed ADA. "I ask that you refer this letter to the Department of Justice Civil Rights Division for their attention in conjunction with the General Services Administration who have been working to resolve it." In a letter from Justice Department dated November 26, 1990, Crawford was referred to GSA, which "has issued guidelines in this area, and continues to work with the computer industry on the issue." Crawford notes, however, that he saw little progress in addressing GUI access at the source: with the manufacturers of operating systems.

The Crisis Develops

Despite the early warnings, no major national advocacy effort developed around the issue of GUI accessibility. No national consumer organization made significant efforts to confront the problem. The issue was, by and large, ignored by the disability press and entirely unknown to most disability rights advocates. Why?

Gregg Vanderheiden believes that there was a certain amount of denial in the blindness community's initial reaction. Bringing up the issue of GUI accessibility, he says, "was like telling somebody, 'Well, you know you're going to die.' No one wants to deal with that." Nolan Crabb, editor and system administrator for the American Council of the Blind's (ACB) World Wide Web site and a software accessibility advocate at ACB, uses the same analogy. "When someone is diagnosed with a terminal illness, the first

stage is denial. 'Oh this can't be happening. The experts must be wrong.' And I think the blind community went through a similar process."

Crabb reports that ACB was aware that GUI would be a problem "from the onset, as far back as the late eighties and early nineties....We passed a variety of resolutions. Dialogue with Microsoft was virtually impossible, because they weren't listening." Despite this awareness, ACB did not undertake a substantial campaign around the issue. "There was talk at one time of picketing Microsoft headquarters, [but] no serious plans were made. Microsoft began to change right about the time we got to thinking that was a valid strategy."

The National Federation of the Blind (NFB) also had trouble coming to grips with GUI accessibility issues. Though it invited representatives from the software industry to its conferences, where the GUI issue was raised, there was never an effort to force a showdown. In part, this had to do with the NFB's larger technology agenda, as explained by Curtis Chong, president of the NFB in computer science.

"We were trying to counteract the overreliance and overdependence on technology by rehabilitation people or people who are blind, who thought of technology as the great savior of the blind. And what we were saying in the Federation was technology is great, but you still have to have your basic blindness skills such as mobility and braille literacy....So for us to deal with technology was a little difficult, because we were trying to get them to stop putting technology at the top of their list....We were trying so hard to get people to deal with technology realistically, I think we almost tried too hard."

The surprising speed with which Windows began to displace other software systems was also a factor. Few anticipated that the changeover from DOS to Windows in the mid-1990s would be so sudden and so widespread. Microsoft itself was said to have been caught by surprise. This element of surprise was exacerbated by the fact that a parallel GUI product, the Macintosh operating system, had not become the employment threat it had first appeared to be because of its relatively slow acceptance in the workplace.

It was also difficult to develop a strategy that offered any chance of success. Some consumers recognized the coming crisis (at the NFB-sponsored U.S./Canada Conference on Technology for the Blind in 1991, for example, and in the January 1994 issue of *Braille Monitor*), but they were unable to get access to the decision makers at Microsoft and the other major companies. And whenever pressure from access advocates did begin to rise, their efforts were short-circuited by assurances from Microsoft that better access was coming.

"Whenever there were the beginnings of sufficient pressure," says Brummel, "that would be capped with a meeting with a Microsoft representative where they said, 'Okay, we hear you, and this is what it's going to be, not to worry'." Speech reader programs were promised for earlier Windows products (3.0 and 3.1), but when these were developed by independent software developers, blind consumers complained that they were unreliable.

"What I was hearing," says Judy Brewer, regarding the screen reader situation in 1994 and early 1995, "was that of probably eight screen readers on the market for Windows 3.1, two were definitely better than all the others. And the best rating these two got on the street was 80 percent efficiency. That's not good enough to keep your job, if your job requires much computer use."

Within the Federal Government, CITA held workshops and training on software accessibility for numerous government agencies. But even when RFPs were successfully negotiated with software accessibility as a consideration, the results were discouraging. Government purchasers had no way of verifying contractor claims of accessibility, which were often overstated. As Susan Brummel put it, "Nobody really knew until the tools began to arrive at the employees' desks" if a software product was truly accessible, by which time it was too late to change the order.

Finally, many people with and without disabilities, find computers intimidating. Nolan Crabb at ACB and Curtis Chong at NFB both report a division in their organizations between those who are comfortable with computers and those who aren't. Furthermore, in both organizations, computer access issues were the exclusive purview of

specific computer committees or departments. These relatively small groups of computer professionals and enthusiasts tended to work in relative isolation, which lessened their organization's ability to respond to the crisis in a timely manner.

Ironically, this was a mirror image of the situation at Microsoft, where all access issues were apparently relegated to one person, Greg Lowney. Both consumer advocates and software developers saw computer access as a technical issue isolated from the concerns of the general organization. And so advocates for information technology accessibility, in relative isolation from the rest of their communities, brought their complaints about Windows to Lowney, who was also toiling in organizational isolation.

NCD's First Involvement

NCD first addressed the issue of computer software accessibility in its *Study on the Financing of Assistive Technology Devices and Services for Individuals with Disabilities*, issued in March 1993. Two of the recommendations were to "establish a Technology Watch program patterned after NCD's current ADA Watch activities to monitor compliance with enforcement of federal rights to or requirements for expanding technology access for children and adults with disability" and to "authorize by statute universal product design guidelines for application in the manufacturing of electronic equipment and other products to enhance accessibility by individuals with disabilities." However, the report was not specific to information technology, but concerned access to assistive technology in general, including such items as durable medical equipment, adapted telephones, hearing aids, and all kinds of adaptive computing equipment for both children and adults.

NCD had not been involved in any aspect of the GUI accessibility issue. It was new Council member Bonnie O'Day who first brought GUI to NCD's attention in the summer of 1994. Herself a blind consumer, O'Day was familiar with screen readers from personal use and had heard accounts of problems with Windows from friends and other consumers. Jamal Mazrui, who had lost a promotion at the Kennedy School of

Government at Harvard because of accessibility problems with GUI, became a volunteer with NCD that summer, devoting his attention primarily to GUI accessibility.

An NCD meeting was scheduled in Seattle in late August 1994. O'Day asked NCD send a letter requesting a meeting among NCD representatives, high-level representatives at Microsoft, and other concerned parties. The letter, dated August 8, 1994, and addressed to Bill Gates, Microsoft chairman and CEO, "expressed concern that Microsoft Corporation is currently in the process of developing Windows based software that will be inaccessible by computer professionals who are visually impaired or blind." It asked for a meeting "to work toward an acceptable solution to this issue."

Among those present at the meeting on August 22, 1994, were NCD representatives; and several future members of Tech Watch, including Paul Schroeder (presently at the American Foundation for the Blind, but at that time representing ACB) and Deborah Kaplan (vice president and director of technology policy at the World Institute on Disability). Also present was Deborah Cook, assistive technology program manager at the Washington State Department of Services for the Blind. None of the Microsoft representatives present had the authority to make the policy or budget decisions necessary to resolve the crisis. Instead, advocates were told that, although GUI accessibility was a difficult technical problem, Microsoft did not see itself as responsible for resolving the problems. Little was accomplished at the meeting, and advocates felt a deep sense of disappointment.

NCD sent a follow-up letter to Bill Gates on August 29, 1994: "While we appreciate the efforts of the programming staff who met with us...we were extremely disheartened by the lack of progress Microsoft is making in addressing this issue. Our experience with monitoring the enforcement of the ADA in other arenas leads us to conclude that a commitment to equal access is vital from the very top of any organization. Therefore, we are requesting a face-to-face meeting with you in hope that you will make this commitment to us."

It was several months before NCD received a formal reply.

Advocacy for Open Windows

The next phase of GUI advocacy evolved in Massachusetts. Charles Crawford at the Massachusetts Commission for the Blind and Judy Brewer at the Massachusetts Assistive Technology Partnership intensified their efforts to put pressure on Microsoft.

The goal, as articulated by Brewer, was twofold: "to convince Microsoft to develop a screen reader applications programmer interface (API), so that screen readers could more effectively interpret information being sent to the screen; and to convince Microsoft to incorporate that screen reader API into their Windows logo program, which authorizes use of the Windows logo on applications software marketing materials, so that people purchasing applications software would know whether the software in question used the screen reader API." One of the technical problems presented by Windows was that, without such standardization, it was virtually impossible for any one screen reader program to work with the numerous Windows applications.

Advocates examined three federal laws that might help in their efforts to ensure GUI accessibility. These were ADA, Section 508 of the Rehabilitation Act, and the Technology Related Assistance For Individuals with Disabilities Act (the Tech Act).

The ADA

Nothing in ADA that directly addresses the development, manufacture, or purchase of inherently inaccessible information technologies for the private sector, and none of the provisions of the Act proved of immediate use to advocates in the GUI crisis. Where an accessible computer might be considered under the Act to be a reasonable accommodation, it was doubtful that ADA would prohibit a large company from switching operating systems from an accessible to an inaccessible interface if such a switch affected only one or two employees or potential employees in a large workforce. Similarly, to force a company that already used Windows to switch back to a DOS or text-based operating system would in most instances be "an undue burden" under the law. Likewise, it was doubtful that the software used to run a business could be considered a public accommodation.

There was some possibility of addressing GUI accessibility through Title II, which prohibits discrimination in services provided by states or the Federal Government. For example, a state employment office developing a data-base of job opportunities would need, under Title II, to provide access to blind users. However, Title II was of little or no help to anyone working or receiving services in the private sector.

The prospect of resolving the GUI crisis solely through ADA enforcement or litigation seemed unlikely.

Section 508

Section 508 was added to the Rehabilitation Act in 1986. It states that federal agencies must provide workers with and without disabilities equivalent access to electronic office equipment. Theoretically, at least, Section 508 meant that federal agencies could not go forward with the purchase of inaccessible software, including GUI.

Several federal agencies have made efforts to comply with 508, for example, the Veterans and Social Security Administrations, but 508 has not resulted in GUI accessibility at all agencies. Indeed, it is difficult to compile an overall picture of federal compliance. Ken Pouloumes, director of acquisition reviews at GSA, which is the agency charged with monitoring 508 compliance, notes that "enforcement is handled at the agency level, not at the GSA level." His office did "look at enforcement for a number of years, but we didn't get into the specifics with any software, GUI or whatever." He reported that the only way to gather information on 508 compliance as it relates to GUI accessibility would be by "pulling specific RFPs" or calling individual agencies "and asking them how they feel they've complied with the Act." Lawrence A. Scadden, senior program director in Science Education for Students with Disabilities at the National Science Foundation and the principal author of 508, says the authors were "naive, and so we didn't write in the teeth that it obviously should have had" to adequately ensure compliance.

Under 508, a private vendor who is unsuccessful in bidding for a federal contract, can initiate legal action to stop or undo a federal software purchase if the vendor can

demonstrate that its product was accessible, and the winning competitor's was not. Theoretically, this provision could augment any enforcement of 508 within the Federal Government. To date, however, no such suit has been filed. According to Brewer, legal action can also be initiated "by an individual who is unable to obtain a reasonable accommodation in a federally or state funded entity because that entity has not procured information technology which is consistent with Section 508."

The Tech Act

The Technology Related Assistance for Individuals with Disabilities Act was passed in 1988 and reauthorized in 1994 to ensure that people with disabilities are able to obtain the assistive technology they require in the settings where it is needed. Title I provides for federal grants to be awarded to states for the purpose of setting up statewide Tech Act projects to address this problem. Currently, more than 50 such projects are funded under the Act in the various states, districts, and territories of the United States. These projects engage in a range of activities including public education, information and referral, training, technical assistance, policy development, and direct systems change advocacy.

The Tech Act mandates that state governments, before they can receive their first extension grant for a fourth or fifth year of funding under the Act, must certify that they are in compliance or working toward compliance with Section 508. Thus, the commitment to accessible office technology is extended from the federal to the state level, as spelled out in a legal opinion of the U.S. Department of Education, handed down in August 1991 to all Tech Act projects. This tie-in was to become crucial to GUI accessibility advocacy. Through this language, the Tech Act projects had, in effect, become enforcers of Section 508 at the state, if not the federal, level.

The Tech Act also stressed that projects must be consumer responsive, which is a principal reason why Judy Brewer and MATP took on GUI accessibility as one of their prime concerns. "We were hearing loudly and clearly from the blindness community that this was something that was very important to them. As a consumer-responsive project,

we felt we had an obligation to respond." For four years, Brewer and other local advocates had tried a variety of strategies, "with little positive outcome. The most significant piece of early work was obtaining a governor's executive order...which reiterated the principles of Section 508 at the state level. We [MATP] also carried out trainings of state agency ADA liaisons, provided technical assistance on development of information technology RFPs, worked with the Governor's Advisory Council on Information Technology on the development of accessible PC standards," and so on.

Crawford and Brewer set out in mid-1994 to convince their state government that purchasing Microsoft's Windows 95 for its offices would be a violation of Section 508 (specifically, Massachusetts Governor's Executive Order 348) unless Microsoft made certain changes to increase product accessibility. To this end, they held a series of meetings with state officials, and disability advocates from outside the blindness community, most notably from the Massachusetts Office on Disability.

Brewer said, "We took it to the Governor's Interagency Coordinating Council on Disability Services in Massachusetts. That group, as the heads of the various disability agencies, said this is something serious and worth pursuing further. And they authorized a series of meetings...with Administration and Finance, the Department of Personnel Administration, the Comptroller's Office, with anybody who had a piece in making the decisions on major information technology procurements....Our ability to point to a governor's executive order, with statutory weight, helped greatly in our discussions within the state."

Crawford added, "I had the idea that we ought to use the 508 compliance combined with ADA combined with the 508 requirement under the Assistive Technology Act. I thought that if we combined those three and then notified every state of that requirement, we might create a sufficient economic block to draw the attention of Microsoft."

In October 1994, Crawford wrote a resolution on GUI accessibility, approved by the National Council of State Agencies for the Blind, that called for each agency to contact the procurement officer for its state and insist that Section 508 be enforced.

NCD published the resolution on the Internet. Simultaneously, Brewer's efforts in Massachusetts were drawing the attention of other Tech Act projects across the country; 15 projects contacted her expressing interest in learning about and possibly joining in an embargo, and a representative of Massachusetts made it known that a multimillion-dollar contract for Microsoft products would fall through if significant progress were not made on GUI accessibility by July 1, 1995. The State of Missouri did in fact institute an embargo on Windows 95 for several months during this period. And, at the federal level, CITA continued to stress the importance of 508 compliance. Several major federal agencies, including the Social Security Administration, began to examine ongoing negotiations for the purchase of Microsoft Windows products in light of their obligation to comply with 508.

The GUI issue had also drawn international attention. The efforts of European advocates such as Cearball O'Meadhra and Ronan McGuirk, founders of the Visually Impaired Computer Society in Ireland, made it evident that GUI accessibility was also an issue to people who are blind and visually impaired in Europe.

NCD Efforts

Ironically, the failure of the August 22 meeting at Microsoft and the subsequent letter from NCD had the effect of raising the issue to the upper management level at Microsoft. Advocates had been concerned that accessibility issues at the corporation were the exclusive purview of one individual: Greg Lowney. While he was held in high regard and was considered to be committed to accessibility, advocates believed that by isolating access issues in this way Microsoft ensured that its programs would continue to cause problems for blind users. The consensus was that accessibility in software, as in architecture or transportation, is best accomplished by incorporating it into all facets of product design, across all departments.

The failure of the meeting also galvanized GUI advocates and brought GUI accessibility to the attention of a much larger segment of the advocacy community. Microsoft was seen to have "snubbed" NCD, and advocates were irked that a major

corporation would treat NCD in this manner. It also made an impression with the Massachusetts state procurement officials with whom Crawford and Brewer were meeting, in that advocates could point to good-faith efforts by the disability community to engage Microsoft in a dialogue; efforts that had, apparently, been rebuffed.

NCD turned its attention to facilitating contacts between accessibility advocates in the state and Federal governments. Crawford and Brewer were invited to Washington to meet with Barbara Silby, chief of staff at GSA. Brewer was given a rundown of federal efforts at 508 compliance and the history of GSA contacts with Microsoft, while GSA learned of the efforts of Massachusetts and other states, and of the concerns of the grassroots blindness community.

The World Institute on Disability in Oakland, California, had also been involved in GUI accessibility, having heard about the problem both from its blind employees and from consumers in the community. Deborah Kaplan's presence at the August 22 meeting was the Institute's first direct contact with Microsoft. In December of that year, Kaplan attended a National Information Infrastructure (NII) Advisory Council meeting, where she "made it part of my agenda to talk with the Microsoft representative there and to ask him why no reply had been received [to the NCD letter of August 29]. I let him know that this was being interpreted very negatively by the community, and that the community was getting more and more upset."

Gregg Vanderheiden too was in contact with Microsoft. "The lack of response to NCD's letter, the way Microsoft dropped the ball at the August 22 meeting, these had an impact. I let Microsoft know that people were angry and would get angrier unless something constructive was done."

Meanwhile, the issue of GUI accessibility began to appear in the mainstream press. The experience of Jamal Mazrui and other consumers with Windows appeared in the *Boston Globe* on October 17, 1994. In March 1995, National Public Radio rebroadcast a story on GUI aired in February by its local affiliate WBUR in Boston. Articles about GUI accessibility problems also appeared in computer-oriented magazines such as *Computerworld* and in blindness publications such as *Tactic* magazine. Microsoft,

in the midst of marketing a new product, found itself the focus of an increasing amount of negative publicity.

GUI was now also becoming a hot item on the Internet, with people who are blind and other consumers with disabilities exchanging "war stories" and independent software developers sharing their thoughts on what needed to happen to make Windows accessible. Some of these messages were addressed to Microsoft directly, others to Crawford, Brewer, or NCD. NCD began collecting accounts from computer users whose lives had been affected by the lack of GUI accessibility and added these stories to the flow of information on the Internet.

It is of course impossible to know which of these factors, or what combination of factors, was decisive in influencing Microsoft to change its stance in regard to GUI accessibility. Many of the advocates interviewed believe that the threat of state and federal embargoes, with the potential loss of tens of millions of dollars in contracts, was the crucial factor. They also point to the growing publicity and the messages to Microsoft from advocates and consumers, explaining the impact GUI inaccessibility had on their lives.

"In the end," says Lowney, "the message was heard, and that's really the important point."

Toward a Resolution

The first verifiable indication of a change at Microsoft came with a letter from Brad Silverberg, senior vice president of the Personal Systems Division at Microsoft Corporation, to NCD, dated January 25, 1995. In that letter, Microsoft made commitments that offered hope for relief for blind computer users.

Silverberg wrote, "Personal computers are powerful tools that enable people to work, create, and communicate in ways that might otherwise be difficult or impossible. The vision of enabling all people can be realized only if individuals with disabilities have equal access to the powerful world of personal computing."

The letter represented a significant, even sweeping, change in Microsoft's stance on GUI accessibility. In it, the corporation agreed to put hooks in Windows programs "to allow independent software vendors (ISVs) to develop third party accessibility aids, especially those which allow blind individuals to use Windows by way of a screen reader." Silverberg said Microsoft would develop a software tutorial for blind users and would hold an Accessibility Summit "where software vendors would be invited to participate in an exchange of ideas and experience creating products for people with disabilities. We won't, however, rely solely on software vendors to do all the work. Some additional utilities we'll build ourselves." Silverberg sent a letter to Commissioner Crawford, with the same list of commitments.

In response to the letter, NCD sponsored a conference call among Microsoft staff, disability leaders, and access advocates. This teleconference reinforced the view among advocates that Microsoft had indeed embarked in a new direction. In a February 21, 1995, response to Silverberg, NCD outlined a more specific accessibility agenda for the corporation, agreed upon during the conference call, that included issuing and then implementing a Microsoft Corporate Accessibility Policy. Such a written policy was unprecedented in the software industry.

"I'd like to think we're making a radical shift," says Lowney, "from where accessibility is really an afterthought to entering a mindset where it's going to be something taken into consideration in every project."

Microsoft's Corporate Policy on Accessibility stipulates that it "is the responsibility of everyone at Microsoft to deliver on this commitment" to access. "Microsoft will devote the time and resources necessary to ensure that an ever greater number of users enjoy access to its products, technologies, and services."

"Windows is more accessible now than it was a year ago," says Mazrui. "And it looks like it will be more accessible next year."

However, the GUI accessibility issue is by no means resolved: People who are blind and visually impaired are still experiencing job dislocation because of Windows inaccessibility. At least one screen reader for Windows 95 and an upgraded screen

reader for Windows 3.1 have appeared on the market, but there are substantial problems with their reliability. And while advocates generally have applauded the corporate policy statement, they note that Microsoft hasn't met some of its own deadlines, and they stress the need for continued advocacy. For example, Microsoft has had problems developing some of the promised accessibility components, such as the off-screen model, and might postpone their delivery until later in 1996. It also became clear at a November 1995 meeting between a Microsoft representative and state agency heads in Massachusetts that Microsoft had not filled the developer position for key accessibility components, which had been open for more than 10 months. Massachusetts officials said they would review future procurements in light of this information. Within two weeks, Microsoft not only hired the developer but added several more developers to its accessibility team in an effort to get back on schedule. However, the community is still waiting for Microsoft's commitment to GUI accessibility to be realized.

NCD: What Went Wrong, What Went Right

Clearly, NCD could have been more proactive in addressing GUI accessibility earlier than it did, although it is of course impossible to know whether an earlier effort by NCD or other advocates might have averted the loss of jobs and opportunity that has occurred in the past two to five years. The same factors that limited the responses of the national blindness organizations may apply to NCD: Technology issues in general, and computer issues in particular, are often difficult for lay people to understand. Indeed, one commonly voiced complaint is that the political leadership of the disability community lacks computer literacy, even with the advent in the past decade of assistive computer technology.

It is also true that an issue, whether it involves civil rights, consumer rights, technology, or any combination thereof, generally do not receive political attention until it has affected the lives of a large group of people. Crawford notes that "most movements of this kind sort of bubble until they reach critical mass, if they ever do, and then they move forward. I'm not saying that [GUI advocacy] shouldn't have happened

earlier, but it's not inconsistent with political history that it didn't. How many accidents happened before Nader wrote his book *Unsafe at Any Speed*? And then how long did it take after that to get some consumer advocacy around cars?"

Nevertheless, NCD could have more aggressively tracked its own reports and recommendations. Two of the recommendations in the March 1993 *Study on the Financing of Assistive Technology Devices and Services for Individuals with Disabilities*—the establishment of a Tech Watch project and NCD involvement in developing "by statute universal product design guidelines" for "electronic equipment and other products"—would most likely have brought an earlier response to the GUI problem. The report specifically mentions Section 508 as designed to "ensure that people with disabilities can access and use the same databases and application programs as other people." Had NCD taken steps to reach out to the Tech Act projects in this regard, it seems likely that the potential of Section 508 and the Tech Act for use at the state level in GUI accessibility advocacy would have been realized far earlier.

However, it is clear that once NCD became involved, it made several important contributions to the resolution of the crisis: first the letter to and meeting with Microsoft in August 1994, and then the follow-up letter to CEO Bill Gates. The effect of a group of community representatives, appointed by the president, taking an interest in GUI was to raise its prominence both in the disability community and at Microsoft. NCD then played a crucial role in facilitating the flow of information among state and federal officials working on the issue. Its interest in 508 enforcement helped to invigorate efforts by Susan Brummel and others at GSA, and GSA action added a national dimension to the efforts of states such as Massachusetts and Missouri. NCD's role in bringing state advocates to meet with GSA was also very useful. According to Brummel, "Basically, what helped our agency was to hear that [Massachusetts and] possibly other states might move into an embargo or a partial freeze on [inaccessible GUI] products." And NCD, by posting on the Internet technical documents, reports of software advocates and developers, consumer comments and accounts, and its own and Microsoft's correspondence, became an important source of information.

RECOMMENDATIONS

How can NCD help to implement GUI accessibility? How can it help to prevent a comparable information technology crisis from happening in the future?

1. **NCD should establish a mechanism to ensure follow-up on its reports and recommendations.**

The establishment of a Tech Watch project was a recommendation in NCD's March 1993 study on assistive technology access. Almost two years passed before this recommendation was implemented, more as a response to the GUI accessibility crisis than to NCD's report. (In fact, this recommendation was not specific to information technology, but rather referred to access to assistive technology of all types. In this regard, it seems the recommendation has yet to be implemented.) NCD should consider ways to better monitor compliance with its recommendations, especially those directed at itself. The Council might include a follow-up mechanism in all future recommendations, with specific persons or groups designated to meet a timetable for progress reports to NCD. Or a committee or task group could be given the responsibility to ensure follow-up on all Council recommendations. In any event, NCD clearly needs to better monitor its own reports and recommendations.

2. **NCD should evaluate methods of ensuring Section 508 compliance.**

NCD, as the federal entity charged with "reviewing and evaluating on a continuous basis the effectiveness of all policies, programs, and activities concerning individuals with disabilities...and all statutes pertaining to federal programs," should consider methods of ensuring 508 compliance in the future. This review becomes

particularly important considering the possibility that GSA may be removed from the picture entirely by changes in federal procurement policy.

To this end, NCD should form links with the various Tech Act projects, which have a clear mandate to enforce 508 at the state level, have had an enormous role in the resolution to date of the GUI accessibility crisis, and possess a wealth of information on technology accessibility and consumer needs and concerns. Such a linkage would also help in the implementation of recommendations 5 and 6 below, in that the Tech Act projects, with their mandate to be consumer responsive, are an important source of consumer input and could be of great help in gathering data for any study of information technology accessibility issues. NCD should explore how these links could be established, with an eye toward facilitating the Tech Act projects' ability to require 508 compliance by the states while NCD pursues strategies at the federal level.

In any case, NCD should continue to raise 508 compliance in any appropriate forum. Finally, NCD should be aware that section 508 is due for reauthorization and might explore developing new language for more effective enforcement.

3. **Tech Watch, in consultation with other interested parties, should investigate the option of having the National Software Testing Laboratory (NSTL) develop an accessibility component as part of its systems testing. Efforts should be made to ensure that consumers are integrally involved in developing accessibility standards.**

Another recommendation made in the March 1993 report was that NCD "authorize by statute universal product design guidelines" for "electronic equipment and other products." In terms of GUI accessibility in particular and software accessibility in general, the most promising option in this regard is an initiative by CITA to enlist NSTL, a division of McGraw Hill in Philadelphia, to add accessibility to its testing criteria. Software developers would submit their products to NSTL, which would test and rate the product for accessibility. State and federal agencies, when making software purchases,

would be able to use this benchmark to determine whether or not a particular product, or combination of products, meets their Section 508 requirement. Susan Brummel reports that the Canadian government has already decided "to start looking at user requirements, folding them into 1996 testing, and bringing people with disabilities in to be a part of that."

Whether or not the NSTL option is adopted, NCD Tech Watch should be an integral part of any effort to develop software accessibility standards. No other federal agency or national disability group is in the position to provide the wealth of consumer input needed to do the job right. Brummel has already asked members of NCD to "help coordinate with the national organizations of people with disabilities, to make sure that the user requirements are derived from real users."

4. **Tech Watch should make it an explicit policy to serve as a conduit of information among software consumers, advocates, researchers and developers.**

Through Tech Watch, NCD can bring together the recognized experts on software accessibility, government, industry, and consumer representatives, so that important issues can be identified and possible solutions outlined before problems grow to crisis proportions. Through Tech Watch, NCD can become a forum for consumers, advocates, and industry, and a way for information to pass among them. Industry would be better able to see the impact of accessibility decisions, while advocates would gain a better understanding of the realities and imperatives of the software industry.

5. **Tech Watch and NCD should consider how to use traditional methods of gauging community concerns (such as public hearings), and more recently developed approaches (such as Internet correspondence and chat groups), to gather information on technology accessibility issues.**

The fact that the major national advocacy organizations at first missed the importance of GUI accessibility points to the need for NCD to maintain its own close connections to the community. Besides frequent contacts with technology accessibility specialists, industry, and the representatives of advocacy organizations, NCD also needs to hear from people with disabilities, most of whom are not affiliated with any advocacy organization.

Charles Crawford believes that NCD "would do best to develop a database of subjects and issues of accessibility, and have an ongoing information process whereby people with disabilities would be able to let NCD know what's going on in their lives. If that sort of system is maintained, then you could generate trends analysis to flag the things that need attention."

During the GUI crisis NCD solicited, on the Internet, personal stories from people who had been negatively affected by GUI. NCD could repeat this call regarding other information technology issues. NCD could also raise its profile with the disability community, by soliciting input on technology issues from the readers of disability publications, thus becoming known as a place to bring concerns about information technology accessibility. Tech Watch could schedule regular public hearings on information access issues at various locations around the country.

6. The information gathered should be used to prepare a report on possible future crises in software accessibility for all disability groups.

One important contribution NCD could make would be to apply the lessons of the GUI crisis and its resolution to software accessibility issues affecting other disabilities. For example, the accelerating proliferation of information kiosks threatens to follow the same pattern as GUI. Few kiosk designers are currently aware of accessibility issues or Section 508, or of possible coverage of their products under ADA as public accommodations. Kiosks using synthesized speech have the potential to be inaccessible to deaf users; kiosks using touch-panels have the potential to be inaccessible

to people with limited dexterity, low vision, or blindness. Some information kiosks already in place are too high to use from a wheelchair. If advocates wait until a substantial portion of the disability community encounters problems with inaccessible kiosks, we could once more have to play catch-up. For the same reasons, NCD should use its influence to raise cross-disability access issues on government and private World Wide Web sites, making sure that kiosks are accessible from their first installation.

Tech Watch should pursue a detailed study of possible future software and information access issues. Consumers, software accessibility experts, advocates, and industry should be canvassed as to what on the information horizon might be of concern. NCD could then repeat the role it took with GUI: raising the issue at the highest echelons of product developers; publishing the responses it receives; and setting up meetings among industry, government, advocates, and consumers to resolve the problems.

7. **NCD, through Tech Watch, should continue to closely monitor Microsoft's efforts to provide access to its products. Follow-up with Microsoft and continued communication with the corporation's top management, are a must if the GUI accessibility issue is to be truly resolved.**

CONCLUSION

The rapid proliferation of personal computing and the arrival of the information superhighway have already had a profound impact on the lives of many people with disabilities. Continuing technology breakthroughs have the potential for empowering people with disabilities or for further limiting their access to the mainstream of society. To ensure access, it is imperative that people with disabilities participate in building the NII.

Such participation will not only empower people with disabilities but will inevitably redound to the benefit of society in general. Susan Brummel, in her white paper on NII accessibility, notes that some of the most important information technologies in use today were developed as a direct result of research into accessibility. The telephone came out of research on educating deaf children. The typewriter was invented to enable people who are blind to write in print. E-mail was developed by a computer scientist familiar with text transmission because his wife was deaf and used a telecommunications device for the deaf (TDD). Even when research into accessibility doesn't immediately result in such world-shaking technologies, it often expands everyone's horizons. The NII and its attendant technologies should be no different.

"If we demand higher standards of accessibility," says Brummel, "we're not only helping our companies to be stronger, by rewarding quality, but we're also ensuring that all our citizens are well served."

APPENDIX

MISSION OF THE NATIONAL COUNCIL ON DISABILITY

OVERVIEW AND PURPOSE

NCD is an independent federal agency led by 15 members appointed by the President of the United States and confirmed by the U.S. Senate.

The overall purpose of NCD is to promote policies, programs, practices, and procedures that guarantee equal opportunity for all individuals with disabilities, regardless of the nature or severity of the disability; and to empower individuals with disabilities to achieve economic self-sufficiency, independent living, and inclusion and integration into all aspects of society.

SPECIFIC DUTIES

The current statutory mandate of NCD includes the following:

- Reviewing and evaluating, on a continuing basis, policies, programs, practices, and procedures concerning individuals with disabilities conducted or assisted by federal departments and agencies, including programs established or assisted under the Rehabilitation Act of 1973, as amended, or under the Developmental Disabilities Assistance and Bill of Rights Act; as well as all statutes and regulations pertaining to federal programs that assist such individuals with disabilities, in order to assess the effectiveness of such policies, programs, practices, procedures, statutes, and regulations in meeting the needs of individuals with disabilities.
- Reviewing and evaluating, on a continuing basis, new and emerging disability policy issues affecting individuals with disabilities at the federal, state, and local levels, and in the private sector, including the need for and coordination of adult services, access to personal assistance services, school reform efforts and the impact of such efforts on individuals with disabilities, access to health care, and

policies that operate as disincentives for individuals to seek and retain employment.

- Making recommendations to the President, the Congress, the Secretary of Education, the Director of the National Institute on Disability and Rehabilitation Research, and other officials of federal agencies, respecting ways to better promote equal opportunity, economic self-sufficiency, independent living, and inclusion and integration into all aspects of society for Americans with disabilities.
- Providing the Congress, on a continuing basis, advice, recommendations, legislative proposals, and any additional information that NCD or the Congress deems appropriate.
- Gathering information about the implementation, effectiveness, and impact of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.).
- Advising the President, the Congress, the Commissioner of the Rehabilitation Services Administration, the Assistant Secretary for Special Education and Rehabilitative Services within the Department of Education, and the Director of the National Institute on Disability and Rehabilitation Research on the development of the programs to be carried out under the Rehabilitation Act of 1973, as amended.
- Providing advice to the Commissioner with respect to the policies and conduct of the Rehabilitation Services Administration.
- Making recommendations to the Director of the National Institute on Disability and Rehabilitation Research on ways to improve research, service, administration, and the collection, dissemination, and implementation of research findings affecting persons with disabilities.
- Providing advice regarding priorities for the activities of the Interagency Disability Coordinating Council and reviewing the recommendations of this Council for legislative and administrative changes to ensure that such recommendations are consistent with the purposes of NCD to promote the full integration, independence, and productivity of individuals with disabilities;

- Preparing and submitting to the President and the Congress an annual report titled *National Disability Policy: A Progress Report.*
- Preparing and submitting to the Congress and the President an annual report containing a summary of the activities and accomplishments of NCD.

CONSUMERS SERVED AND CURRENT ACTIVITIES

While many government agencies deal with issues and programs affecting people with disabilities, NCD is the only federal agency charged with addressing, analyzing, and making recommendations on issues of public policy that affect people with disabilities regardless of age, disability type, perceived employment potential, economic need, specific functional ability, status as a veteran, or other individual circumstance. NCD recognizes its unique opportunity to facilitate independent living, community integration, and employment opportunities for people with disabilities by ensuring an informed and coordinated approach to addressing the concerns of persons with disabilities and eliminating barriers to their active participation in community and family life.

NCD plays a major role in developing disability policy in America. In fact, it was NCD that originally proposed what eventually became ADA. NCD's present list of key issues includes improving personal assistance services, promoting health care reform, including students with disabilities in high-quality programs in typical neighborhood schools, promoting equal employment and community housing opportunities, monitoring the implementation of the Americans with Disabilities Act, improving assistive technology, and ensuring that persons with disabilities who are members of minority groups fully participate in society.

STATUTORY HISTORY

NCD was initially established in 1978 as an advisory board within the Department of Education (Public Law 95-602). The Rehabilitation Act Amendments of 1984 (Public Law 98-221) transformed NCD into an independent agency.